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THE NEW ENGLAND BOTANICAL CLUB

Vol. 48. June, 1946. No. 570.

NOTES ON AQUATIC AND PRAIRIE VEGETATION IN SOUTHWESTERN MINNESOTA[1]

R. M. Tryon, Jr. and J. W. Moore

During the course of plant collecting in Minnesota in 1945[2], it occurred to us that a trip to the southwestern part of the state might yield some interesting plant records. Early in the season some plants of western distribution were found in temporary rock pools on Sioux Quartzite in Cottonwood County. Knowing of the presence of similar conditions in Rock County we traveled down to Luverne with high expectations of making some worthwhile discoveries.

A few miles north of Luverne in Mound Township the Sioux Quartzite forms a series of gently rounded hills higher than the surrounding countryside. The southern extremity of the rock is marked by a sheer rock wall. On the top the glacial drift is very thin. The rock is close to the surface and exposed in many places. Numerous pools were present in the early summer between the low rock ridges and in shallow depressions. They occur dispersed in a typical rocky prairie habitat. Later in the summer these pools usually become dry.

Probably the unusually wet spring and early summer were responsible for the rich aquatic flora encountered. Dormant seeds had perhaps germinated for the first time in several years, since the area had been visited several times in the past and

[1] Contributions from the Herbarium of the University of Minnesota I.

[2] The field work was supported in part by a grant in aid of research from the Graduate School of the University of Minnesota.

many of the plants present this year were not represented in the collections previously made.

The distribution of species in Minnesota is based on specimens in the Herbarium of the University of Minnesota and published reports. Distribution outside of the state is based on current manuals and special treatments. All specimens cited are in the Herbarium of the University of Minnesota. Unless otherwise indicated collections were made by the authors on July 8, 1945, in Rock County, Minnesota. The following list includes five species and two forms reported for the state for the first time and seven species that are very rare in the state.

Around a fairly large rock pool about three miles north of Luverne the following plants were found growing:

ISOETES MELANOPODA Gay ex Dur., 17557, in mud; 17559, in 2–4 inches of water at a similar pool about a quarter mile southwest of the large pool. These collections represent the first evidence of the occurrence of this species in Minnesota.

SCHEDONNARDUS PANICULATUS (Nutt.) Trel., 17556. This grass grew in the prairie at the edge of the rock pool. A single collection of the species is represented in the University of Minnesota Herbarium: Pipestone, Pipestone County, July, 1895, *M. Menzel*. *Schedonnardus* was reported for Minnesota by Upham[1] as *Schedonnardus texanus* Steud. (*Lepturus paniculatus* Nutt.) as occurring on "Rocky hills, Mound township, Rock county, Leiberg." The nearest known occurrence for this species is in South Dakota.

HETERANTHERA LIMOSA (Sw.) Willd., 17554. This blue-flowered species is another aquatic which has not previously been reported for Minnesota. The species has been reported from South Dakota.

ELATINE TRIANDRA Schkuhr f. INTERMEDIA Seubert, 17551. This form, new to Minnesota, is the aquatic phase which grows in shallow water. It has been reported from Wisconsin and South Dakota. The species, *Elatine triandra*, was reported by Sheldon[2] as having been collected in pools near Cannon river, Burnside Township, Goodhue County, Minnesota, by A. P. Anderson, August, 1893. We have not been able to locate specimens of this, but is it likely that they represent f. *intermedia* as they grew in shallow pools.

CALLITRICHE HETEROPHYLLA Pursh, 17552. Although reported for Minnesota by Muenscher[3], this species was not pre-

[1] Upham, Warren, Catalogue of the Flora of Minnesota. p. 169. 1884.
[2] Sheldon, E. P., Minnesota Botanical Studies 1: 16, 1894.
[3] Muenscher, W. C., Aquatic Plants of the United States, p. 262, 1944.

viously represented from the state in the Herbarium. An additional collection with mature fruit was made later in the summer on October 19, 1945, *J. W. Moore & N. L. Huff*, 18431, in an intermittent creek at Mound Spring State Park, a short distance northeast of the rock pool under discussion.

Limosella aquatica L., 17548. One previous collection had been made in Minnesota: Pipestone, Pipestone County, June, 1895, *M. Menzel.*

Plagiobotrys scopulorum (Greene) I. M. Johnston, 17553. The nearest known locality for this species is western South Dakota. Prior to this year it was not known to occur in Minnesota. Earlier in the season very young plants were obtained from a rock pool on a Sioux Quartzite outcrop in Delton Township, Cottonwood County, Minnesota, May 29, 1945, *J. W. Moore & J. W. Posz*, 16935.

Hordeum pusillum Nutt., 17550. This species is of rare occurrence in Minnesota. Upham[1] first reported the species from Blue Earth County as collected by Leiberg. Other collections from Minnesota are: Pipestone, Pipestone County, June, 1895, *Menzel* and May, 1932, *Fellows;* Brown County, July, 1938, *Rosendahl,* 6926.

The following species were associated with those listed above: *Koeleria cristata* (L.) Pers., 17561; *Carex Eleocharis* L. H. Bailey, 17564; *Juncus Dudleyi* Wiegand, 17562; *Allium canadense* L., 17566; *Delphinium virescens* Nutt., 17560; *Potentilla pennsylvanica* L. var. *strigosa* Pursh, 17565; *Linum sulcatum* Riddell, 17549; *Gratiola neglecta* Torr., 17555; *Verbena simplex* Lehm., 17558.

In a prairie pasture about four miles north-northwest of Luverne rock pool plants were again encountered; some were the same as those previously collected and some were additional ones. The water in some of these pools had evaporated leaving a moist layer of mud. Other pools still had an inch or two of water in them.

Marsilea vestita Hook. and Grev., 17578. This was growing in some abundance at the margin of a pool. The only previous collection from Minnesota is: Pipestone, Pipestone County, September 15, 1938, *J. W. & M. F. Moore*, 10550.

Isoetes melanopoda Gay ex Dur., 17582.

Myosurus minimus L., 17586. Previous collections are: Big Stone County, June, 1901, *Holzinger & Anderson;* Chippewa County, May, 1909, *Moyer;* Pipestone County, May, 1935, *Rosendahl et al.*, 3052.

[1] Upham, Warren. Catalogue of the Flora of Minnesota, p. 169, 1884.

TILLAEA AQUATICA L., 17584. This interesting little plant has escaped detection in Minnesota until now. According to the reported range for North America, our collection is a new record for both Minnesota and the Great Plains Region of the United States and Canada.

ELATINE TRIANDRA Schkuhr f. TERRESTRIS Seubert, 17585. The terrestrial form in drying mud is new to Minnesota.

HYDRANTHELIUM ROTUNDIFOLIUM (Michx.) Pennell, 17579. This species is also known from Lac qui Parle County where it was collected by Moyer and from Lyon County where it was collected by N. L. Huff.

LIMOSELLA AQUATICA L., 17581.

PLANTAGO ELONGATA Pursh, 17587. We are reporting this species from Minnesota for the first time, although there is one previous specimen preserved in the Herbarium: Pipestone, Pipestone County, June 15, 1931, *Fellows*.

The following species were collected at the same locality in the adjacent prairie: *Stipa spartea* Trin., 17574; *Hordeum jubatum* L., 17583; *Anemone canadensis* L., 17570; *Lepidium densiflorum* Schrad., 17571; *Rosa arkansana* Porter, 17572; *Scutellaria parvula* Michx., 17573; *Acerates lanuginosa* (Nutt.) Dcne., 17568; *Verbena simplex* Lehm., 17580; *Erigeron strigosus* Muhl. ex Willd., 17569; *Achillea lanulosa* Nutt., 17577.

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UNIVERSITY OF MINNESOTA, Minneapolis.

NOTES ON THE COMPOSITAE OF THE NORTHEASTERN UNITED STATES

III. INULEAE AND SENECIONEAE

ARTHUR CRONQUIST

My condensation of the Antennarias of the northeastern United States (RHODORA **47**: 182–184. 1945) has been criticized at some length by Fernald (RHODORA **47**: 221–235; 239–247. 1945). At the root of the trouble in *Antennaria* is the problem of apomixis. Some workers, especially those in Europe, have contended that each apomict should be treated as a distinct species, since it is self-perpetuating, and can, at least theoretically, be differentiated from all other apomicts by morphological minutiae. There are three noteworthy objections to such a pro-

cedure. First, it represents a radical departure from the traditional concept of a species, ill-defined though that concept may be. Second, even in apomictic groups, apomixis is not always obligatory. Occasional normal sexual reproduction may occur, or, in some part of the range, be quite common. Fernald has admitted this to be true in *Antennaria*. These sexually reproducing plants may transcend the variation of several apomictic races, as has been demonstrated in *Crepis acuminata* by Babcock and Stebbins. One is then faced with the choice between distinguishing as separate species the normally variable offspring of the sexual plants, or using apomixis itself as a specific criterion. Few botanists would defend either procedure, in theory. Third, the number of apomictic races may be so great that in practice it becomes impossible to distinguish them clearly. In a hypothetical case of completely obligatory apomixis, there is no doubt that apomict a and apomict z are readily distinguishable, even though they may occur in the same area. Apomicts d, g, o, and s, as they are successively discovered and studied, are likewise distinguishable, although the differences between them are not so great as between a and z. But when apomicts a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, and z have been discovered and named, a wholly confluent series is formed. Having once started splitting, the worker must either continue to describe new species ad infinitum, or undo his previous work on the group. The latter rarely happens. It is apt to take a relative new-comer, with an unbiased viewpoint and no axes to grind, to plunge into things and restore some degree of sanity to the situation.

The alternative to treating each apomict as a separate species is to group them, insofar as possible, into units comparable in taxonomic significance, variability, and clarity of definition, with the ordinary sexual species. The principal difficulty here is that the normal specific lines may be obscured by the persistence, as apomictic races, of the occasional interspecific hybrids. It may then become necessary to admit more than the usual amount of intergradation between species, in order to obtain units otherwise comparable to the strictly sexual species. A recent treatment embodying this alternative approach is that of *Crepis* by Babcock and Stebbins. After the most intensive and thorough study

that has yet been given to a large American genus, these authors concluded that the only practical systematic approach was to admit the existence of numerous more or less distinguishable apomicts within a single species, while also admitting an unusual amount of intergradation between species.

In considering the Antennarias of the manual range, I was unable to distinguish consistently and with reasonable certainty the great mass of recent segregates. The characters, as shown by our specimens, are just not as constant as has been claimed. I therefore found it necessary to prepare a new and more conservative treatment. Although monographic study, making use of the material from all the major herbaria (which is beyond the scope of any floristic treatment) might conceivably warrant certain adjustments in my treatment of varieties, I am convinced that the entities considered do properly fall into only three well-founded and reasonably distinct species. The concluding paragraph of Stebbins' reply (Rhodora **38**: 367–369. 1936) to Fernald's reduction of *A. virginica* and its variety *argillicola* to varietal status under *A. neodioica* is wholly pertinent: "I recognize that there is overlapping between *A. virginica* and *A. neodioica* in some characteristics, but since I am aware of an equal amount of overlapping between *A. fallax* and *A. Parlinii* (particularly in the southern and western portions of their range), *A. neglecta* and *A. petaloidea* (chiefly in Wisconsin), *A. petaloidea* and *A. neodioica* (throughout the north central states), and *A. Parlinii* and *A. Brainerdii* (in central New York) I feel that, in he interests of consistency, the reduction of *A. virginica* to a variety calls for a similar reduction of *A. Parlinii*, *A. petaloidea*, *A. Brainerdii*, and probably other species now recognized in the floras of eastern North America."

It is my opinion that the first opinion expressed by Fernald regarding the validity of *A. virginica* is correct, and that Stebbins' subsequent comments are wholly justified. Stebbins' indication of the particular areas in which intergradation is most noticeable is of particular significance. It cannot be too strongly emphasized that apparently constant differences in one locality may be broken down completely in some area, if apomixis is involved. The plants which break down the differences between two otherwise well-characterized apomicts may be still other apomicts

(since potentially there is an apomict for every genotype) or they may be sexually reproducing plants showing the normal variability involved in cross-breeding. In either case the result is the same: differences which appear constant in one restricted area may vanish in some other area. With apomictic groups, even more than with sexual groups, therefore, the whole range of variability of the species, throughout its whole geographic distribution, should be considered before any program of segregation is initiated.

There are, however, some valid criticisms in Dr. Fernald's paper. I overlooked the existence on the Gaspé peninsula of two boreal and cordilleran species, *A. alpina* (L.) Gaertn. and *A. umbrinella* Rydb. These are the species which he reports as *A. vexillifera* and *A. subviscosa*, respectively. *A. vexillifera* Fern. is merely one of a host of recent segregates from *A. alpina* (L.) Gaertn., a highly variable circumpolar species. Doubtless several varieties should be recognized, but their taxonomy and nomenclature are yet far from clear. For the present I think it best to associate *A. vexillifera* Fern. with *A. alpina* (L.) Gaertn. var. *canescens* Lange.

Antennaria subviscosa Fern. appears to me to be identical with the northern and western *A. umbrinella* Rydb. This species is interesting in that it shows the most ideal transition, sometimes even on the same head, between the contrasting phyllary-types of the *A. alpina* group and the *A. dioica* group (including *A. neglecta, A. plantaginifolia, A. parvifolia, A. microphylla,* and others). In the former the cellular structure of the scarious part of the phyllary is more or less evident under 25 diameters magnification, and the pigment (varying from dirty green to brownish or nearly black) is in the cell walls. In the latter the cells are laterally compressed so that their raised walls are closely parallel and give the phyllary-tip a finely striate appearance, and the pigment, if any (mostly whitish or pink), is diffuse. Most of the western specimens of *A. umbrinella* have glabrous achenes, but *Hitchcock and Martin 5600*, from Nye County, Nevada, recently so determined by Dr. S. F. Blake, has them papillate, as in *A. subviscosa*. Since apparently no other characters are associated with it, papillosity of the achenes would seem to fail in this case as a specific criterion.

Two collections from the same station in western Minnesota form the basis for Dr. Fernald's inclusion of *A. aprica* Greene in the manual range. I concur in the identification of the specimens, which mark the eastern limit of the known range of the species. Unfortunately the name *A. parvifolia* Nutt. antedates *A. aprica* Greene and applies to the same species. This was pointed out to me recently by Dr. Blake, and I confirmed it by examining Nuttall's isotype at Philadelphia.[1] Of more than 30 specimens of *A. parvifolia* examined for achaenial papillae, about half were seen to be papillate at 25 diameters magnification, a few which seemed glabrous at 25 diameters were seen to be sparsely and minutely papillate when examined at 50 diameters, and the rest were apparently glabrous even at 50 diameters. In some cases specimens of the same collection, looking very

[1] Dr. Fernald informs me that Nuttall's material of *Antennaria parvifolia* at the British Museum contains plants of *A. rosea* Greene and *A. microphylla* Rydb., as well as *A. aprica* Greene, and suggests a need for further clarification. (It is my present opinion that *A. microphylla*, *A. rosea*, and a number of other western segregates properly constitute a single polymorphic species, but these names are here used in the more restricted sense.) In accordance with Article 52 of the Rules, it becomes necessary to settle upon one of these as the basic element of *A. parvifolia*, to which the name should be restricted. Both *A. microphylla* and *A. rosea* may be excluded on the basis of Nuttall's description. The leaves of *A. microphylla* rarely exceed 1 cm. in length, and are certainly not "half or three-quarters of an inch long . . . [and] somewhat rhomboidally spathulate". *A. rosea*, on the other hand, occasionally has leaves as large as those described by Nuttall, but may be excluded by its pink phyllaries. In the diagnosis of the species Nuttall says that the involucral bracts are yellow. In the more general discussion he says in one place that they are yellow, and in another that they are purple. Obviously here the two color-types are being included in the same species; just as obviously, the pink (or purple) type must be considered a subordinate element, since it is mentioned only in the general discussion and is definitely excluded by the preliminary diagnosis. It should further be noted that occasional otherwise representative specimens of *A. aprica* have a distinct pink cast to the phyllaries, but it is to be assumed that the part of the type-collection of *A. parvifolia* which Dr. Fernald refers to *A. rosea* is not of this nature. One further difficulty remains: both *A. microphylla* and *A. aprica* have white rather than yellow phyllaries. Either of these, particularly *A. aprica*, may develop a yellowish tint in drying, however, and it must be remembered that the drying equipment available to Nuttall was not up to present-day standards. Both *A. microphylla* and *A. rosea* reach the edge of their range in the vicinity of the type-locality of *A. parvifolia* ("On the Black Hills and plains of the upper part of the Platte"), and are there uncommon. *A. aprica*, however, abounds in that region. Except as noted above, Nuttall's description and comments apply very well to *A. aprica* Greene; one of the two exceptions may be explained by inadequate means of drying specimens, and the other by the inclusion of a definitely subordinate element (*A. rosea*) with the more characteristic specimens. Certainly Nuttall's description and comments are more applicable as a whole to *A. aprica* than to either *A. rosea* or *A. microphylla*. It therefore seems plain that the name *Antennaria parvifolia* Nutt. should properly be applied to that part of Nuttall's type which has pale phyllaries and comparatively large leaves (these leaves, incidentally, being much smaller than those of the common eastern species). This part is conspecific with *A. aprica* Greene, which is therefore reduced to synonymy.

much alike superficially, varied from apparently glabrous to evidently papillate. Although papillosity of the achenes is doubtless valuable in some cases as a taxonomic character, it seems that Mr. Porsild and Dr. Fernald have overestimated its importance. Linnaeus' maxim, "Characterem non constituere Genus, sed Genus characterem", is equally true of species.

In conclusion, the species of *Antennaria* known to occur in northeastern United States and the portion of adjacent Canada south of the St. Lawrence River, as I understand them, may be keyed as follows:

1. Involucral bracts brown or dirty blackish green throughout: leaves about 1.5–5 mm. wide; Gaspé, Que., and northward. . . *A. alpina.*
1. Involucral bracts (at least the inner) white or whitish toward the tip; leaves often much larger.
   2. Upper surface of the leaves nearly or quite as densely hairy as the lower, glabrate, if at all, only in extreme age; Gaspé, Que., and northward; w. Minn. and westward.
      3. Pistillate involucres mostly 5–7 mm. high; terminal scarious portion of the outer involucral bracts more or less discolored and brownish; Gaspé, Que., and northward. . . . . *A. umbrinella.*
      3. Pistillate involucres mostly 8–11 mm. high; terminal scarious portion of the outer bracts, as well as the inner, white (or occasionally becoming yellowish in drying) and shining; w. Minn. and westward. . . . . *A. parvifolia.*
   2. Upper surface of the basal leaves distinctly less pubescent than the lower, sooner or later glabrate; throughout our range (*A. solitaria* toward the south only).
      3. Basal leaves and those at the ends of the stolons relatively small, less than 1.5 cm. wide, 1-nerved or obscurely 3-nerved. . . . . *A. neglecta.*
      3. Basal leaves and those at the ends of the stolons relatively large, prominently 3–5-nerved, the larger ones 1.5 cm. wide or more.
         4. Heads several. . . . . *A. plantaginifolia.*
         4. Heads solitary. . . . . *A. solitaria.*

Gnaphalium purpureum L. var. **purpureum,** var. nov. *Gnaphalium purpureum* L. Sp. Pl. 854. 1753, sens. strict.

Gnaphalium saxicola Fassett is as yet known from only a very few collections in Wisconsin, but is approached by occasional specimens from elsewhere in the range of *G. obtusifolium.* At least until a larger series of specimens demonstrates its morphologic and genetic discontinuity, it seems better treated as a variety of *G. obtusifolium.*

Gnaphalium obtusifolium L. var. **saxicola** (Fassett), comb. nov. *Gnaphalium saxicola* Fassett, Rhodora **33:** 75. 1931.

Erechtites megalocarpa Fern. was described from saline coastal marshes in Massachusetts. It has subsequently been reported from Rhode Island and Long Island, and specimens in the local herbarium of the New York Botanical Garden extend the known range to Ocean County, New Jersey. It differs from *E. hieraciifolia* (L.) Raf. in its fleshiness, broader heads, and larger achenes with more numerous nerves, as well as some minor and inconstant tendencies or trends. The succulence is not preserved in the herbarium, and dried specimens of the two are superficially very similar. The several technical differences would at first seem to be of specific importance, but a study of our material shows no real discontinuity. In this connection, it is interesting to note that Millspaugh and Chase (Field Mus. Pub. Bot. **3:** 146. 1904) describe the Yucatan plants of *E. hieraciifolia* as having achenes up to 3.8 mm. long, although Fernald, in noting the large achenes (4–5.5 mm.) of *E. megalocarpa* indicates that those of *E. hieraciifolia* are only 2–3 mm. long. It seems reasonable, therefore, to treat *E. megalocarpa* as merely a well-marked ecotype of saline coastal marshes.

Erechtites hieraciifolia (L.) Raf. var. **megalocarpa** (Fern.), comb. nov. *E. megalocarpa* Fern. Rhodora **19:** 24. 1917.

In trying to determine the differences between *Petasites palmatus* (Ait.) Gray and *P. vitifolius* Greene I was led into a general consideration of the *P. frigidus* group, to which they belong. The principal differences which have been used for taxonomic segregation within the group are in the size, shape, and lobing of the leaves, but it soon became apparent that these differences, while striking, are far from constant. The differences adduced by Rydberg in the relative lengths of the throat and teeth of the corollas of the perfect flowers are unstable and apparently wholly without taxonomic value.

It is my opinion that only two closely related species should be recognized in this group, namely *P. frigidus* Fries and *P. sagittatus* (Banks) Gray. Both species are variable, rendering a simple and concise statement of their differences most difficult. The leaves of *P. sagittatus* vary from merely a little wavy and callous-denticulate (especially in smaller specimens) to more commonly conspicuously dentate with 20–35 teeth on each side. Those of *P. frigidus,* on the other hand, vary from coarsely toothed, with

5–15 teeth on each side (in smaller forms), to more or less distinctly lobed (in larger forms), and then often with more numerous teeth. The venation, toothing, and lobing of *P. frigidus* is pinnipalmate in small forms, becoming progressively more strongly palmate in larger ones; in *P. sagittatus* the venation is pinnipalmate throughout, the leaves often becoming conspicuously longer than broad. These differences, while seemingly weak, are in practice sufficiently constant to leave very few if any doubtful specimens, and the two species can generally be distinguished at a glance.

The appearance of *P. sagittatus* is sufficiently characteristic so that only one segregate, *P. dentatus* Blankinship, has been proposed. This was reduced by Rydberg in the North American Flora. The extremes of variation in *P. frigidus*, on the other hand, seem so different that nearly a dozen segregates have been proposed. These rest almost entirely on foliar characters, however, and are seen to be confluent when a large series of specimens is examined. The facts were seen in their proper perspective as long ago as 1865, when Herder recognized two American and one European variety of *P. frigidus*, in addition to the circumpolar typical one. His summary of the situation is worthy of quotation: "Diese hoch-nordische Pflanze zeigt eine grosse Verschiedenheit in der Configuration und Zahnung ihrer Blätter, so dass, wenn man nur einzelne Exemplare aus einer Gegend hat, man leicht in den Fall kommt, auf ihre oft eigenthümliche Blattgestaltung hin, Arten zu gründen." It remains only to transfer his names from the segregate genus *Nardosmia* to *Petasites* and refer the more recent names to their proper places.

Petasites frigidus (L.) Fries var. **genuinus** (Herder), comb. nov. *Nardosmia frigida* var. *genuina* Herder, Bull. Soc. Nat. Mosc. 1865: 372. *Petasites gracilis* Britton, Bull. N. Y. Bot. Gard. **2:** 186. 1901. *P. alaskanus* Rydb. N. Am. Fl. **34** (4): 314. 1927. *P. Warrenii* St. John, Res. Stud. State Coll. Wash. **1:** 109. 1929. Leaves relatively small, pinnipalmately veined, coarsely and irregularly toothed, but only scarcely or obscurely lobed.

Petasites frigidus (L.) Fries var. **corymbosus** (R. Br.), comb. nov. *Tussilago corymbosa* R. Br.[1] App. Parry's First Voy.

[1] Dr. Fernald in personal correspondence has raised a question as to the identity of *Tussilago corymbosa* R. Br. The original description is clear enough, noting that the leaf-lobes are equal to ⅓ to ½ of the "radius" of the leaf, and are themselves toothed,

279. 1824. *Nardosmia corymbosa* Hook. Fl. Bor.-Am. **1:** 307. 1833. *Nardosmia frigida* var. *corymbosa* Herder, Bull. Soc. Nat. Mosc. 1865: 372. *Petasites trigonophyllus* Greene, Leafl. **1:** 180. 1906. *P. vitifolius* Greene, loc. cit. *P. nivalis* Greene, Pitt. **2:** 18. 1889. *P. corymbosus* Rydb. Bull. Torrey Club **37:** 460. 1910. *P. hyperboreus* Rydb. N. Am. Fl. **34** (4): 312. 1927. *P. frigidus* var. *hyperboreoides* Hulten, Fl. Aleutian Isl. 328. 1937. Leaves mostly pinnipalmate, distinctly lobed, the lobes seldom extending more than half way to the base.

Petasites frigidus (L.) Fries var. **palmatus** (Ait.), comb. nov. *Tussilago palmata* Ait. Hort. Kew. **3:** 188. 1789. *Nardosmia palmata* Hook. Fl. Bor.-Am. **1:** 308. 1833. *Nardosmia Hookeriana* Nutt. Trans. Am. Phil. Soc. II. **7:** 288. 1841. *Nardosmia frigida* var. *palmata* Herder, Bull. Soc. Nat. Mosc. 1865: 372. *Nardosmia speciosa* Nutt. Trans. Am. Phil. Soc. II. **7:** 288. 1841. *Petasites palmatus* var. *frigidus* Macoun, Cat. Can. Pl. **1:** 553. 1886. *Petasites speciosus* Piper, Mazama **2:** 97. 1901. *Petasites speciosus* var. *frigidus* Henry, Fl. S. Br. Columb. 311. 1915. *P. Hookerianus* Rydb. N. Am. Fl. **34** (4): 314. 1927. Leaves distinctly palmate, the lobes generally extending more than half way to the base.

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the teeth mucronulate. The leaf size given, 1½–2½ inches broad, is within the range of normal variation of the entity to which Hooker, Herder and I have successively attached the name, although many of the more southern specimens, in particular, are often much larger. A photograph at the Gray Herbarium of some fragments in the British Museum which are supposed to represent type material collected by Captain Sabine on Melville Island shows a plant similar in size, habit, and general characteristics to what has been assumed to be an isotype in the Gray Herbarium, the two being apparently of the same collection. Both of these differ from Brown's description, however, not only in the smaller leaves (barely 3 cm. wide in the Gray Herbarium specimen, apparently even narrower in the other), but also in having the leaves merely toothed, and seem to represent the typical phase of *P. frigidus* as understood by me. The flowering stalks do have the corymbiform inflorescence described by Brown (a character now generally conceded to be of no taxonomic value here), but in neither specimen is the accompanying basal leaf organically attached to the flowering stem. In the Flora Boreali-Americana Hooker distinguishes *Nardosmia corymbosa* (based on *Tussilago corymbosa* R. Br.) from *N. frigida* solely on its leaf-outline, and cites specimens by Parry, Sabine, and Richardson. Since Brown was describing plants collected on the Parry expedition as well as the Sabine expedition, the name may well have been founded partly or even wholly on the Parry collection. On the basis of Brown's clear and explicit description, in which he specifically contrasted the leaves of *T. corymbosa* with those of *T. frigida*, I find it difficult to believe that the specimen in the Gray Herbarium, or the specimen which Dr. Fernald has photographed in the British Museum is authentic material of *T. corymbosa*. There may have been an error in the labeling or the mounting, or the Sabine collection may have been mixed, since *Petasites frigidus* is certainly to be expected on Melville Island. In any case, the basal leaves accompanying the specimens mentioned at the Gray Herbarium and the British Museum can scarcely be considered to form part of the true type of *Tussilago corymbosa* R. Br. Under the circumstances, and especially since he evidently had authentic material at his disposal, I think it proper to continue Hooker's interpretation of the name.

As might be expected, the species increases progressively in size with amelioration of the habitat, so that var. *genuinus* is the most reduced, and the var. *palmatus* averages the largest. *P. speciosus*, of the Pacific coastal states, has the leaves a little less deeply lobed, on the average, than do the ordinary forms of the transcontinental *P. palmatus*, but the differences are slight and inconstant, and many specimens are quite indistinguishable.

More collections are needed before the precise limits of range of each variety may be defined. In general, the var. *genuinus* is the most boreal of the three, and the only circumpolar one. It is known to extend south in the high mountains to Washington. The var. *corymbosus* is found through much of the American range of var. *genuinus*, but extends farther south, reaching Gaspé, Que., Mich., and Minn. The var. *palmatus* is the most southern of the three, extending as far as Mass., on the east coast, and Calif., on the west.

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AMELANCHIER SPICATA NOT AN AMERICAN SPECIES

M. L. Fernald

(Plates 1027–1030)

The name *Amelanchier spicata* (Lam.) K. Koch has dodged in and out of American treatments of the genus but was supposed to have been finally dismissed by Wiegand in his critical studies of the genus, when he wrote in Rhodora, xiv. 123 (1912):

> Those who have seen these specimens and the type specimen of *Crataegus spicata* [of Lamarck, basis of *A. spicata*], as well as specimens of our Eastern American stoloniferous fine-toothed *Amelanchier* agree that they all appear to be one and the same thing. Flowers and leaves in the exsiccatae match those of this stoloniferous species as well as one could wish, as do also the flowers and leaves in the original descriptions. The original description of *C. spicata*, however, gives the height of the plant as from two to three times that of the native European species of *Amelanchier*, which, figured out, would mean about 2–5 m. [$6^3/_4$–$16^9/_{10}$ feet]. Willdenow gives the height as 2–2.5 m. In addition, Mr. Alfred Rehder has stated to the writer that the plant in European gardens commonly passing under the name *A. ovalis* [*A. ovalis* sensu Borkh., equaling *A. spicata*, not *A. ovalis* Medicus, the native European species] is not low and stoloniferous but tall and fastigiate.

Wiegand considered that *Amelanchier spicata* was "of hybrid origin" and, believing the European tradition that it came from Canada, he guessed that it might have been a hybrid of the tall and fastigiate or arborescent *A. canadensis* (L.) Medic. (*A. oblongifolia* (T. & G.) Roemer) and the freely stoloniferous and colonial dwarf *A. stolonifera* Wiegand. The latter conjecture seems not well supported by the detailed characters of *A. spicata*, as shown by the photograph of the type taken by Professor Alfred Rehder, reproductions, × 1, of which are shown in our PLATE 1027, and the tall fastigiate habit sufficiently demonstrates that *A. spicata* has nothing, except generically, to do with the low and freely stoloniferous and loosely colonial shrubs of eastern North America.

In spite of this conclusive evidence from those who have long known the importance of such characters in the genus, the name *Amelanchier spicata* (Lam.) K. Koch suddenly pops up again[1] as indubitably belonging to three low ("0.3–2 m. tall") native North American "surculose colonial shrubs", *A. stolonifera* and *humilis* Wiegand and *A. austromontana* Ashe. Since this interpretation by Professor George Neville Jones is so at variance with those of Wiegand and of Rehder, while the photograph of the type of *Crataegus spicata* and Lamarck's original account of it show complete departure in foliage, flowers, fruit and habit from the characters of these three American species, it becomes necessary to check the type and the description of *C. spicata* (our PLATE 1027) with some care.

The aggregate *Amelanchier spicata* sensu G. N. Jones, not of anyone else, is defined, in part, as "Low surculose colonial shrubs 0.3–2 m. tall; . . . lateral veins 7–9 pairs, . . . distantly arranged . . . ; . . . sepals . . . usually recurved from the middle after anthesis". Now, if we examine Professor Rehder's photograph of the type of *Crataegus spicata* (portions shown in our PLATE 1027) it will at once be evident that the lateral veins do not stop at "9 pairs . . . distant", as defined by Jones, but exceed that maximum and, as compared with the really distant lateral veins of *A. stolonifera* (our PLATE 1029, FIGS. 3 and 4, and PLATE 1030, FIG. 2, both from the TYPE) are relatively approxi-

[1] In G. N. Jones, Am. Species of Amelanchier, Ill. Biol. Mon. xx. no. 2: 51 (1946). See review in this journal, pp. 129-134.

mate. Similarly, the TYPE of *A. humilis* (see Jones, plate xv) and what Jones takes as an isotype of *A. austromontana* (Jones, plate xvi) have the lateral veins fewer and more distant than in the type of *A. spicata*, besides more elongate blades with more uniformly subacuminate tips. In foliage, then, *A. stolonifera*, *humilis* and *austromontana* are very inadequate matches for the leaves of *A. spicata*. In the type of *A. spicata* (PLATE 1027, FIG. 2) the sepals and petals are erect, not a very convincing match for the "sepals usually recurved from the middle after anthesis" of the three American shrubs (see our PLATE 1029 FIGS. 1 and 2, and 1030, FIG. 1), while in ours the petals diverge. It is to me quite evident from the photograph of the type-specimen of *A. spicata* that in flowers, as well as leaves, it is not any of the American shrubs which Jones identifies with it, he saying (p. 57) "it becomes clearly evident that Lamarck's *Crataegus spicata* is the common and widespread small serviceberry of eastern North America". Wiegand, Rehder and others had already clearly shown that it is not, for the Lamarck shrub is fastigiate and up to 16 or more feet ("—5 m.") high, not a very convincing similarity to "Low surculose colonial shrubs 0.3–2 m. tall."

Lamarck's own account should be convincing:

> 8. ALISIER à épis, *Crataegus spicata. Amelanchier du Canada* à petites fleurs.
>
> Cet arbrisseau a beaucoup de rapport avec le précédent; mais il s'élève deux ou trois fois davantage. Ses feuilles sont pétiolees, arrondies, dentées, vertes en dessus, pâles en dessous, & glabres des deux côtés dans leur parfait dévéloppement. Elles sont alors à-peu-près aussi larges que longues, & ont un pouce & demi de diametre ou environ. Les fleurs sont blanches, petites, & naissent sur des grappes un peu étroites, qui ressemblent à des épis. Ces grappes sont munies de petites bractées linéaires, colorées, caduques, & qui sont plus longues que les pédoncules propres de chaque fleur; ce qui n'a point lieu dans l'espece précédente. Les pétales sont une fois plus courts que ceux de l'Amélanchier, & ses baies sont une fois plus grosses que les siennes, c'est-à-dire, ont au moins la grosseur des fruits du Prunelier ou Prunier épineux. On prétend que cet arbrisseau se trouve au Canada. On le cultive au Jardin du Roi & dans les jardins des Curieux, ainsi que le suivant. (*v. v.*)—Lam. Encycl. Meth. i. 84 (1783).

Immediately following this account Lamarck described as *Crataegus racemosa* the American fastigiate shrub or tree which was common in European gardens and which Linnaeus had de-

scribed as *Mespilus canadensis*, the species correctly called *Amelanchier canadensis* (L.) Medic., but known until recently as *A. oblongifolia* (T. & G.) Roemer[1], an American species to which various American students (Robinson, Rehder and others) have sometimes referred shrubs which Jones now places in his heteromorphic "*A. spicata*". If *Crataegus spicata* were, as we are now positively assured, "the common and widespread small serviceberry of eastern North America", in which Jones includes elements which others have considered variations of *A. canadensis* (*Crataegus racemosa* Lam.), it is astounding that Lamarck did not suggest the resemblance but distinctly said that his new *C. spicata* "has much the aspect of the preceding, but rising two or three times as high". As to "the preceding", it was the one native European species (our PLATE 1028) of *Amelanchier*, the type of the genus, *Mespilus Amelanchier* L., called by Lamarck *Crataegus rotundifolia* Lam. l. c., the species correctly called *A. ovalis* Medicus but often known as *A. vulgaris* Moench or *A. rotundifolia* (Lam.) Dum.-Cours. Wiegand's figures for the height, 2–5 m. (or up to nearly 17 feet) and Rehder's statement that *A. spicata* is a tall and fastigiate shrub, already quoted, do not seem like Jones's "Low, surculose colonial shrubs 0.3–2 m. tall". Altogether the original account by Lamarck gives as little support to the recent misidentification of *A. stolonifera* et al. as *A. spicata* as does the photograph of the type.

Lamarck compared his *Crataegus spicata* only with the one European species, his *Crataegus rotundifolia*, the *Amelanchier ovalis* Medicus, but it was much taller and with larger leaves and fruit, the leaves of *C. rotundifolia* "petites en comparaison de celles des autres espèces". When we examine characteristic material of *A. ovalis* (our PLATE 1028), we note the leaves with outline much as in the type of *A. spicata*, with their veins similarly subapproximate; the sepals and petals erect; and the pedicels and hypanthium densely pilose (FIG. 2). It is difficult to escape the conclusion that *A. spicata* is closely related to the European *A. ovalis*. If it is desired, on account of its much greater height and fastigiate development, to consider it of hybrid origin, why not invoke *A. canadensis* (*oblongifolia*), as is done by Wiegand

[1] For detailed study of this identification and for photograph of the type of *Mespilus canadensis* see RHODORA, xliii. 560–563, plate 672, fig. 1 (1941).

Photo B. G. Schubert, after Alfred Rehder

TYPE, × 1, of AMELANCHIER SPICATA (Lam.) K. Koch (*Crataegus spicata* Lam.).

Photo B. G. Schubert

The European AMELANCHIER OVALIS: FIG. 1, flowering and fruiting branches, × 1; FIG. 2, portion of flowering raceme, × 5.

Photo B. G. Schubert

AMELANCHIER STOLONIFERA from TYPE-SERIES: FIG. 1, flowering branch, × 1; FIG. 2, portion, × 5, of raceme just past anthesis; FIGS. 3 and 4, lower and upper faces of mature leaves, × 1.

Photo B. G. Schubert

AMELANCHIER STOLONIFERA from TYPE-SERIES: FIG. 1, branch with half-grown fruit, × 1; FIG. 2, leaves of vegetative sprout, × 1.

and by Rehder (Man.), but without dragging in the very different *A. stolonifera*. In *A. canadensis*, which had long been cultivated in European gardens and which, like *A. spicata*, "on cultive au Jardin du Roi", the leaves are broadly rounded at summit, the young hypanthium densely pilose and the sepals soon erect or strongly ascending.

The insistence that *Amelanchier spicata* originated in America is based on rather unsatisfactory evidence. Lamarck did not assert that it came from Canada, but that "They pretend or claim that it is found in Canada" ("On prétend que cet arbrisseau se trouve au Canada"). That was a qualified statement, not a clear statement that it is Canadian. It seems more probable that it originated in the Jardin du Roi, possibly as a cross of *A. canadensis* and *A. ovalis*. It is time to exclude without quibble the name *A. spicata* (Lam.) K. Koch from North American treatments of *Amelanchier*.

Explanation of Plates 1027–1030

Plate 1027, Amelanchier spicata (Lam.) K. Koch, both figs. enlarged to × 1, from photograph of type of the basic *Crataegus spicata* Lam. (from negative taken by Professor *Alfred Rehder* and preserved in the Herbarium of the Arnold Arboretum): figs. showing vegetative leafy shoot with subapproximate lateral nerves, the blades broadly rounded to subtruncate, the calyx-teeth and petals strongly ascending.

Plate 1028, Amelanchier ovalis Medic.: fig. 1, flowering and fruiting branches, × 1, from Alsace, *Spach* (note broadly rounded to subtruncate leaves with subapproximate ribs; also erect calyx-lobes and petals); fig. 2, portion of flowering raceme, × 5, showing densely pilose pedicel and calyx; also erect calyx-teeth and petals.

Plate 1029, Amelanchier stolonifera Wiegand, all figs. from type: fig. 1, flowering stem, × 1, showing long smoothish pedicels and spreading calyx-teeth and petals; fig. 2, summit of raceme just past anthesis, × 5, showing glabrous pedicels and calyx and spreading calyx-teeth; figs. 3 and 4, lower and upper faces of mature (autumnal) leaves, showing remote ribs, × 1.

Plate 1030, Amelanchier stolonifera Wiegand, both figs. from type: fig. 1, stem with half-mature fruit, showing short-acuminate leaves, long glabrous pedicels and spreading calyx-teeth; fig. 2, leaves of vegetative sprout, showing distant ribs.

A Monograph of Amelanchier.—Perhaps no genus of the *Rosaceae* in North America, except of course *Rubus* and *Crataegus*, has offered so much of perplexity and has had such contradictory treatment as *Amelanchier*. Wiegand brought much light into the problem and established by his detailed studies, published from 1912 to 1921, the more important characters of growth-habit, flowers, fruit and foliage of the several eastern North American species. Wiegand, however, too much accepted traditional misidentifications and apparently did not always trace the older names to their actual types; his strength lay in his tireless field-observa-

tions and clarification of morphological characters. Most of the types have subsequently been checked and the names of several species, of which the morphological characters were accurately and painstakingly worked out by Wiegand, have, consequently, been readjusted. Now comes a beautifully printed and well illustrated monograph of 100 pages and 23 plates by Professor George Neville Jones[1]. Professor Jones dismisses at once the decision of Wiegand and very many others with extensive field-experience that hybridization occurs to any extent in *Amelanchier*, although he does actually admit the single hybrid, × *A. grandiflora* Rehder and in a note concedes a cross of *A. Bartramiana* and *A. canadensis*. His conclusion is based on cytological studies by others in the subfamily *Pomoideae*, Sax having reported, as quoted by Jones, "that the pure species of Amelanchier that he studied are diploids, but two natural interspecific hybrids are tetraploids" and Moffett having stated that "the chromosome number of the Pomoideae is a 'secondary basic number (unbalanced relative to the primary basic number) and the derived series of polyploids . . . are secondary polyploids'." Jones goes on: "It seems possible, therefore, that polyploidy may have played a more important part in the differentiation of genera and species in this subfamily than has heretofore been realized, since a change in chromosome balance is usually accompanied by a change in the morphological characters of the plant". Isn't it common knowledge that the vast number of strikingly different and fully appreciated apples and pears (such strikingly dissimilar apples as Baldwin, Gilliflower, Lady and Red Siberian, or such contrasted pears as Bartlett, Seckel and Beurre Bosc) are the result of hybridization? Ability to hybridize is the basis of pomology. If the *Pomoideae* did not freely lend themselves to crossing, apples and pears would be pretty poor food. Groups in which hybridization (therefore allopolyploidy) is rare or difficult to achieve are not horticultural successes! Professor Jones dismisses generally recognized hybridization in the *Pomoideae* because "polyploidy may have played a more important part"; but he does not seem to recognize the elementary fact that allopolyploidy is an accompaniment of hybridization! Witness the distinction between the two types of polyploidy as clearly indicated in Julian Huxley's "Evolution: the Modern Synthesis" (p. 334):

> Next we have the various phenomena of polyploidy in which a multiplication of whole genomes or chromosome-sets occur. As already mentioned, polyploidy is of two fundamentally distinct types: autopolyploidy in which the chromosome sets are all of the same kind, derived from the same species, and initial allopolyploidy, in which they are of different kind, derived from two distinct species. The actual doubling is in both cases due to the suppression of division of a cell after division of the chromosomes has taken place, but whereas this is the primary event in autopolyploidy, in allopolyploidy it is subsequent to hybridization.

The generally recognized hybrid of *A. Bartramiana* and *A. laevis*, which Dr. Jones evidently, from the citation of specimens, has known only as dried material collected by others, is treated as a full species, *A. neglecta* Eggleston, although the specimens loaned to Dr. Jones for study often have his validation as "× *A. neglecta*"! Most other hybrids, of which

[1] GEORGE NEVILLE JONES. American Species of Amelanchier. Illinois Biological Monographs, xx. no. 2. 100 pp. 23 plates. Univ. Ill. Press, Urbana, Ill. 1946. $1.50, paper-cover; $2.00, cloth-cover.

Wiegand had very many, are placed without reservation in single recognized species because, by the author's unique reasoning, they are polyploids.

A total of 18 species is admitted for the whole continent, an ultra-conservative number which many, who have had more extended field-acquaintance with the shrubby members, will doubtless be inclined to augment. Pubescence (usually a pretty variable and too often a passing character) is largely relied upon, the first division of the eastern species depending on "Top of ovary glabrous" as opposed to "Top of ovary tomentose, usually densely so, rarely with only a few trichomes", while under the latter the eastern species are again divided on more or less persistence of pubescence. This may be the best that can be done, but it is unfortunate that so fluctuating a character as persistence of pubescnce has to be made fundamental. The characters of hypanthia, sepals, petals, styles, etc., used to separate species, seem more stable; and growth-habit, which is well understood by those who, like Wiegand, spent many seasons in studying the genus in the field over an extensive area, is really important.

Dr. Jones reproduces, most happily, photographs, so far as they were accessible to him, of types or isotypes, a large proportion of the originals borrowed from the Gray Herbarium. In two cases only tracings made by others and borrowed by him are given, as in plate XI, fig. 1, a tracing made by the late Benjamin L. Robinson and bearing in his hand the explanation, or in plate XVII, fig. 2, another tracing made by Dr. Robinson (with his characteristic handwriting nearly covering the sheet). These illustrations are invaluable.

In some cases, at least, the photographs of the types lead one to wonder at the identifications. For instance, plate XI, fig. 2, shows a small and not very clear photograph of *Crataegus spicata* Lam., basonym of *A. spicata* (Lam.) K. Koch, which Dr. Jones feels to be "clearly . . . the common and widespread small serviceberry of eastern North America": *A. humilis* Wiegand, *A. stolonifera* Wiegand and the more localized and southern *A. austromontana* Ashe. Whether those who have for many years known the stoloniferous and loosely colonial low *A. stolonifera* and *A. humilis* will be satisfied that the calcicolous inland *A. humilis* and the oxylophytic *A. stolonifera,* chiefly of the Atlantic slope, are identical is very doubtful; and it is extremely doubtful if anyone but Dr. Jones will be satisfied that either of these dwarf and colonial American shrubs is identical with the non-colonial, fastigiate and very tall *Crataegus spicata* of Lamarck. The latter, a shrub of unknown nativity, supposed or claimed to have come from Canada ("On prétend que cet arbrisseau se trouve au Canada"), was cultivated in Paris in 1783. Lamarck stated that his *C. spicata* strongly resembled the widespread European species, *Mespilus Amelanchier* L., which under *Amelanchier* is known as *A. ovalis* Medicus, *A. vulgaris* Moench or *A. rotundifolia* (Lam.) Dum.-Cours., the species which had been called by Lamarck *Crataegus rotundifolia.* Lamarck said that his *C. spicata* was two or three times taller ("Cet arbrisseau [*Crataegus spicata*] a beaucoup de rapport avec le précédent [*C. rotundifolia*], mais il s'élève deux ou trois fois davantage"). Since Lamarck's *C. rotundifolia* was 3–5 feet high ("la hauteur de trois à cinq pieds"), that would make *C. spicata* measure "about 2–5 m." (as pointed out by Wiegand who is quoted by me in the illustrated study of Lamarck's type on p. 125, with plate 1027 in this number of Rhodora) in

height. The North American *A. humilis* is consistently lower, 0.3–1.5 m. high ("3–12 dm.", Wiegand, and also Rosendahl & Butters, Trees and Shrubs Minn.; "4–15 dm.", Deam, Shrubs Ind.), while *A. stolonifera* (details shown in plates 1029 and 1030 in this number) is quite as low ("3–12 dm.", Wiegand). Dr. Jones, discussing the habit of species, says (p. 10): "Certain other species, e. g., *A. spicata,* are usually dwarf, but under exceptionally favorable conditions may reach a height of two meters". That still falls far short of the maximum of 5 meters implied by Lamarck for the cultivated type of *A. spicata;* and if, as Dr. Jones believes, the southern *A. austromontana* belongs to all-inclusive *A. spicata,* it is too bad that he restricted the height to "0.3–2 m.", for *A. austromontana* was originally described by Ashe as "not exceeding 4 m. in height" (a back-handed way of implying at least more than 2 m.). The photographs of types of *A. spicata, A. stolonifera, A. humilis* and *A. austromontana* are, fortunately, all shown by Dr. Jones and outlines of characteristic leaves are displayed separately. While the leaves of the type of *A. spicata* (see plate 1027 in the article preceding this review) are quite broadly rounded to subtruncate at summit, those of all three American types are of narrower and more elongate outline and more gently rounded or tapering to the short-tipped apex and the veins of *A. spicata* are relatively more approximate. The three Americans are closely akin; the type of *A. spicata* evidently an alien, with leaves closely matched in outline, toothing and venation by very many specimens of the European *A. ovalis* Medic. (*Mespilus Amelanchier* L.) (See plate 1028 in preceding article).

If, as would seem from the photograph of the type, *Crataegus spicata* Lam. is a variation or perhaps a hybrid of the European *Amelanchier ovalis,* then it would be distinguished from our shrubs by several characters, including, according to Rehder's Manual, "Styles free" in *A. ovalis* as opposed to "Styles connate at least at base" in the remainder of the species, this character sometimes considered to have such magic that it is relied upon as the final argument in keeping apart as genera *Pyrus* ("Styles free") and *Malus* ("Styles connate at base")[1]. If it be maintained that *Amelanchier spicata* is not a phase of or derivative from *A. ovalis,* it can, at least, not be satisfactorily identified with three or more lower and habitally very different American species.

Further differences from the interpretations of Wiegand and others, like the reduction outright to *A. sanguinea* (Pursh) DC. of *A. huronensis* and *A. amabilis* Wiegand, need not here be discussed. They at least show very strong departures in interpretation of characters.

Outline maps with dots indicate the ranges. These, it must be assumed, give a general picture of the range, and when such strongly contrasted areas as those of the western *A. pallida* (map 13) and of the eastern *A. Bartramiana* (map 1) are shown the contrast is striking. When, however, *A. stolonifera, humilis* and *austromontana* are merged (as *A. "spicata"*) one does not know how, from the map, to sort out the different elements which others recognize as true species. In some cases more attention to exact geography would have been desirable. For instance, map 2 is said to show the range of *A. neglecta.* It does in a general way, but since this shrub is not cited (or known) from the Magdalen Islands, it is at least disconcerting to see the outlines of that archipelago blackened out by a

[1] For an analysis of the reputed but sadly inconstant morphological characters separating *Malus* from *Pyrus* see RHODORA, XLV. 450 (1943).

round dot. From Nova Scotia a single collection is cited, from Meteghan, at the western end of the Province, but unsupported dots are shown all the way to northern Cape Breton, more than 500 miles northeast of the one recorded station at Meteghan. Again, the great Province of Quebec seems to have been as much of a puzzle to the map-maker as it was when, in his *Monograph of Symphoricarpos* in Journ. Arn. Arb. xxi. 216 (1940), he cited the type of *S. albus* as coming from "Quebec, Ontario, Canada". On the map of *A. neglecta* a single row of six equally spaced dots runs from the tip of the Gaspé Peninsula to the Richelieu River south of Montreal and no dot is shown north of the River St. Lawrence. Five stations are cited (instead of six): Gaspé Bay; Montmagny (more than 300 miles to the southwest); Montmorency Falls (a famous tourist-resort about 40 miles west of Montmagny and NORTH of the St. Lawrence); Lac Long (about 65 miles northwest of Montmorency and also NORTH of the St. Lawrence); and "Ottawa River" (hundreds of miles long and joining the St. Lawrence FROM THE NORTH). A mere outline of the general range might have suggested the main point; the failure carefully to consult an atlas would be less evident.

All in all the new monograph of *Amelanchier* is a very neat piece of presswork. Its illustrations of types are well reproduced and most helpful, the general ranges approximately shown (though slipping on unfamiliar territory), its descriptions detailed, the recent identifications by others of types of American species accepted (but the specific segregations and the hybrids of Wiegand not admitted) and the citations of specimens very full (though said to be incomplete). In the latter particular, with what Wiegand and many others have always considered quite separate elements here merged, it would have helped others if specimens of the different included elements could have been indicated by some sign. Where individual judgment so radically differs as in this "Monograph", especially through obviously unequal degrees of field-work and consequent understanding of the different characters and, likewise, through failure to recognize the well known fact that allopolyploids are hybrids, it would have helped, so long as the largest portion of the work is given over to very full listing of specimens, if the original identifications by Wiegand of his own species, for instance, had been noted. That would partly separate the different elements. Then the shrub which Wiegand and scores of other critical students (Butters, Deam, Fassett, Rehder, Rosendahl and many more) have considered *A. humilis* would not (when merged with the habitally similar *A. stolonifera* under the impossibly American and habitally very dissimilar *A. "spicata"*) appear to occur from Newfoundland to Georgia, where it is not found.

In the enumeration of numbered specimens (admittedly only a part of those seen) the author of the latest treatment of *Amelanchier* has the very modest score of 32, Wiegand of 85, a score which could and certainly should have been most profitably increased if Wiegand's authoritative series of 696 sheets left at Cornell University and his earlier authentic series of 63 sheets at Wellesley College—a total, with the 85 cited assumed to be duplicates, of more than 750 sheets, which largely formed the bases of Wiegand's detailed publications over ten years—had been consulted. Most surprisingly, however, there is no indication in the acknowledgments that the new author on *Amelanchier* was interested to see this great fundamental mass of authentic material. One other close field-student of the

genus over many years, one who understands the southeastern species, is credited with having participated in the collection of 183 cited numbers; another, who has closely watched the group in the field for half a century and who largely accompanied the painstaking Wiegand, with about 225. These are mere trivialities compared with Wiegand's record of more than 750 but impressive when compared with a total score of only 32. If these clear evidences of field-experience and intensive work on and understanding of the genus had been reversed, perhaps the results would be very different.—M. L. F.

The Varieties of Lycopodium inundatum.—The circumboreal *Lycopodium inundatum* L., if it had stayed in the cool-temperate areas of Eurasia, would present no troublesome problem. In North America, however, it is one of a series of species and varieties which extend, as a somewhat perplexing group, all the way from Newfoundland to the Tropics. By many authors it has been considered to be confluent with the coarse *L. alopecuroides* L. of the southeastern United States and the West Indies, a species characterized by its low-arching or recurved-procumbent stem rooting at the tip, its leaves linear- or narrowly lance-attenuate and with the similar sporophylls usually bristly-ciliate, the upright densely leafy fertile branches 0.5–1.5 cm. thick, the strobile 1–2.5 cm. thick, the spores with coarsely reticulate base and with the apical half covered with coarse papillae crowded into rows. Thus Hooker in his British Ferns (1861) wrote, under *L. inundatum*, pl. 51: "*L. Carolinianum* and *L. alopecuroides*, and not a few others, supposed species, must be added to this list, if we were to make the exotic synonymy complete"; then, to add to the bibliographic confusion, he cited as a synonym "Lycopodium Bigelovii. *Oakes and Tuckerman in Sillim. Journ.*". The latter unverified reference Hooker obviously borrowed from Spring, Mon. Fam. Lycopod. pt. ii. 33 (1849), who had cited as a synonym of *L. inundatum* L.: "L. Bigelovii *Oakes et Tuckerm.*! *prius* (*ex Tuckerm. in Sill. Journ. of Nat. Hist.*)." Oakes and Tuckerman made no such binomial! Instead, Tuckerman in Am. Journ. Sci. and Arts (conducted by Professor Silliman and Benjamin Silliman, Jr.), xlv. 47 (1843) had under *L. inundatum* two varieties: "β. *Bigelovii*, (mihi): majus, ramis subramosis elongatis, foliis acuminatis sparsim denticulatis s. integris. *L. Carolinianum*, *Bigel. Fl. Bost. p.* 384.—γ. *alopecuroides*, (mihi): . . . *L. alopecuroides* L.",

etc. The significant point is that var. β. *Bigelovii*, based in part on *L. carolinianum* Bigel. Fl. Bost. ed. 2: 384 (1824), not L., Bigelow's plant with "peduncle . . . long, slender", coming from Cape Cod (Sandwich), was based by Tuckerman primarily on a collection from "Plymouth, Oakes and Tuckerman". Spring confused the collectors with the author and wrongly made them the authors of a species they did not describe; Hooker followed suit and in copying Tuckerman's synonymy, neglected to emphasize that he meant *L. carolinianum* sensu Bigelow, not L.

As pointed out by me in Rhodora, xxiii. 100 (1921), the type of *Lycopodium inundatum*, var. *Bigelovii*, the Oakes and Tuckerman plant from Plymouth, is inseparable from *L. adpressum* (Chapm.) Lloyd & Underwood or *L. Chapmani* Underwood, this well illustrated in Britton & Brown, Ill. Fl. ed. 2, i. fig. 104 (1913), their fig. 105, purporting to show *L. alopecuroides*, being made from a specimen of *L. inundatum*, as shown by the short creeping sterile branches, the slender fertile branch, and the ovate-based sparsely toothed sporophyll. In some later writings, as in Rhodora, xxxviii. 382 (1936), I lost the thread and confused two varieties, taking up again *L. inundatum*, var. *adpressum* Chapm. for what had earlier been described as var. *Bigelovii* and treating, incorrectly, as var. *Bigelovii* a coarser variety which had been described from southern New England and New Jersey as *L. inundatum*, var. *robustum* R. J. Eaton in Rhoroda, xxxiii. 202 (1931). As I now understand the three varieties of *L. inundatum* they may be defined as follows.

Leading creeping terminal shoot elongating from 1.5–10 (when submerged –15) cm. beyond the last of the 1 or 2 (very rarely 3) fertile branches; fertile branches 0.5–7 (rarely –10) cm. high; strobile 0.8–4 cm. long, 6–10 mm. thick, its ovate- or lanceolate-based bracts with loosely ascending to spreading tips; transcontinental northern plant. . *L. inundatum* (typical).

Leading creeping terminal shoot elongating from 0.7–4 dm. beyond the last of the mostly 2–10 fertile branches; the latter 0.5–4 dm. high; strobile (1.5–) 2–15 cm. long, its bracts with lanceolate bases; southeastern and eastern coastwise plants.

Fertile branches stiffly erect (flexuous only when drowned), 2–5 mm. thick, densely covered with loosely ascending to spreading leaves mostly 5–8 mm. long; strobiles 7–14 mm. thick at base, including tips of loosely ascending to spreading elongate (5–8 mm.) bracts; sporangia mostly hidden under the bracts. . . . . Var. *robustum*.

Fertile branches erect or flexuous, 1.5–3 mm. thick, more openly covered with appressed or ascending leaves 3–5

mm. long; strobile 3–7 mm. thick, with closely appressed or ascending shorter (3–6 mm.) bracts; outlines of sporangia (at least in dry specimens) often evident through the thin bracts.....Var. *Bigelovii.*

L. INUNDATUM L. Sp. Pl. 1102 (1753).—Damp peaty or sandy shores, swamps or bogs, Newfoundland to Alaska, south to Nova Scotia, New England, New Jersey, Pennsylvania, mountain-region to western Virginia and West Virginia, northern Ohio, northern Indiana, northern Illinois, Minnesota, Idaho and Oregon; Eurasia.

Var. ROBUSTUM R. J. Eaton in RHODORA, xxxiii. 202 (1931). Var. *Bigelovii* sensu Fernald in RHODORA, xxxviii. 382 (1936), not Tuckerman.—Eastern Massachusetts, south on or near coastal plain to Florida and Louisiana.

Var. ROBUSTUM, forma **furcatum** (Fernald), comb. nov. Var. *Bigelovii,* forma *furcatum* Fernald in RHODORA, xliv. 377 (1942).

Var. BIGELOVII Tuckerm. in Am. Journ. Sci. xlv. 47 (1843). *L. carolinianum* sensu Bigelow, Fl. Bost. ed. 2: 384 (1824), not L. (1753). Var. *appressum* Chapm. in Bot. Gaz. iii. 20 (1878), altered to Var. *adpressum* Chapm. Fl. So. U. S. ed. 2: 671 (1883). *L. alopecuroides,* var. *adpressum* (Chapm.) Chapm., Fl. So. U. S. ed. 3: 638 (1897). *L. adpressum* (Chapm.) Lloyd & Underwood in Bull. Torr. Bot. Cl. xxvii. 153 (1900). *L. Chapmani* Underwood in Maxon in Proc. U. S. Nat. Mus. xxiii. 646 (1901). *L. alopecuroides,* ssp. *adpressum* (Chapm.) Clute, Fern Allies, 118, pl. 5 (1905). *L. alopecuroides,* forma *adpressum* (Chapm.) Clute in Fern. Bull. xvii. 48 (1909).—Florida to eastern Texas, north on or near coastal plain to southeastern New Hampshire and Nova Scotia, where freely passing into typical *L. inundatum.*

Var. BIGELOVII, forma **polyclavatum** (McDonald), comb. nov. *L. adpressum,* f. *polyclavatum* McDonald in Fern Bull. ix. 9 (1901). *L. alopecuroides,* var. *adpressum,* f. *polyclavatum* (McDonald) Clute in Fern Bull. xvii. 45 (1909). *L. inundatum,* var. *adpressum,* f. *polyclavatum* (McDonald) Fernald in RHODORA, xlii. 405 (1940).—M. L. FERNALD.

NEW COMBINATION IN CHRYSOBALANUS.—As a preliminary to issuing the next century of the Plantae Exsiccatae Grayanae it becomes necessary to make the following new combination:

CHRYSOBALANUS **pallidus** (Small), comb. nov. *Geobalanus pallidus* Small, Fl. Miami, 81, 200 (1913).—LYMAN B. SMITH, Gray Herbarium.

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